

and are graphed and there is a high degree of parallelism to the lines, then the change may be safely assumed to have been environmentally induced. Straight numerical measurement comparisons would also be objective.—DEPT. OF BOTANY, SOUTHERN ILLINOIS UNIVERSITY.

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CONTRIBUTIONS TO THE FLORA OF NOVA SCOTIA

E. C. SMITH AND W. B. SCHOFIELD

NORTHERN Cape Breton Island has been noted by various botanists to contain a relatively rich "isolated flora." Few recent discoveries have been made there due, no doubt, to the relatively inaccessible nature of the interior of the northern plateau. The following lists of plants collected mainly in this area add a number of arctic-montane species to the provincial flora and indicate the desirability of an extended study of this element in Nova Scotia. With this in mind, various phyto-geographical comments have been omitted from the present paper.

The annotated lists below are mainly the result of exploration in Cape Breton Island during the summer of 1951. This exploration was carried out as part of a detailed ecological survey of the forests of the area, a survey sponsored by the Nova Scotia Research Foundation. Some of the taxonomic results of earlier surveys for the Foundation have been reported by D. S. Erskine (1951).

Grateful acknowledgement is made to the following persons: to W. G. Dore of the Central Experimental Farm, Ottawa, for critical determination of the *Gramineae*; to B. Boivin of the Cen-

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Throughout the paper various abbreviations are used. 1. The forest ecology parties (a) SSSB; E. C. Smith, W. B. Schofield, D. R. Sampson, F. C. Bent in 1951; (b) SCBS: E. C. Smith, E. H. Collins, J. M. Bruce, D. R. Sampson in 1949; (c) SCBSB: E. C. Smith, E. H. Collins, J. M. Bruce, D. R. Sampson, F. C. Bent in 1950; (d) SECS: E. C. Smith, D. S. Erskine, E. H. Collins, W. B. Schofield in 1948; (e) SESB: E. C. Smith, D. S. Erskine, D. R. Sampson, F. C. Bent in the spring of 1951. 2. DAO: Department of Agriculture, Ottawa.

1. RECORDS OF PLANTS PREVIOUSLY UNREPORTED FROM THE PROVINCE

Of the investigated areas in Northern Cape Breton, that of the Big Southwest Brook, Inverness County, yielded the greatest number of new and rare species. The cool, moist limestone cliff walls of this brook added a habitat to those known in the province.

WOODSIA ALPINA (Bolton) S. F. Gray (*W. Belli* (Lawson) A. E. Porsild) Although reported for Nova Scotia by Roland (1947), the species there referred to is probably *W. glabella* R. Br. (Roland, 1941.) Abundant on dry cliff of brook, North Aspy River near Cabot Trail, SSSB 4522.

TYPHA LATIFOLIA L., forma AMBIGUA (Sonder) Kronf. This form is undoubtedly more common than the following records suggest. Colchester County: shallow pool in excavated area, roadside near Kemptown, SSSB 4807; Inverness County: swamp, Big Intervale, Margaree, SCBS 2791; Hants County: roadside ditch, Walton, J. S. Erskine 51.113.

FESTUCA PROLIFERA (Piper) Fern. Inverness County: very rare on wet slope near large waterfall, Big Southwest Brook, south-west branch, SSSB 4545.

FESTUCA PROLIFERA (Piper) Fern., var. LASIOLEPIS Fern. Victoria County: very abundant in cliff crevices near waterfall, Gray Glen Brook, north branch, SSSB 4441.

POA GLAUCA Vahl. Another range gap is closed by the following collection, Inverness County: occasional on limestone cliffs in moist shaded situations, Big Southwest Brook, SSSB 4583; "not exactly like the *P. glauca* of arctic regions" (Dore, *in litt.*)

SCIRPUS CESPITOSUS L., var. DELICATULUS Fern. The variety *callosus* Bigel. is widely distributed in Nova Scotia, being particularly conspicuous near the Atlantic coast and forming a major element of the vegetation in

bogs (e. g. Brier Island, Digby County and Northern Cape Breton Island). The variety *delicatulus* is locally abundant, festooning dripping limestone cliffs, Big Southwest Brook, Inverness County, *SSSB 4578*.

RHYNCHOSPORA CAPILLACEA Torr., forma *LEVISETA* (E. J. Hill) Fern. Inverness County: growing abundantly in alkaline bog in association with *Eleocharis pauciflora* var. *Fernaldii*, Black River, *SSSB 4969*. This should be sought elsewhere in similar habitats.

BETULA GLANDULOSA Michx. This species, which superficially resembles *B. pumila* L., may be commoner than the following collection suggests. Victoria County: near margin of Twin Island Lake, Ingonish Barrens at an elevation of 1300 feet, *SSSB 4623*. Here it was luxuriant in a colony of considerable extent.

OXYRIA DIGYNA (L.) Hill. This interesting plant, of wide distribution in the arctic, was a surprising addition to the flora of the province. Inverness County: locally abundant on shelves of dripping cliffs, Big Southwest Brook, *SSSB 4550*. The plants were very vigorous and differed from much arctic material in that they were almost devoid of red coloring and the leaves were relatively flaccid.

SAXIFRAGA AIZOIDES L. Inverness County: luxuriant on dripping limestone cliffs, Big Southwest Brook, *SSSB 4555*.

VACCINIUM OVALIFOLIUM Sm. (*V. chamissonis* Bong.) Victoria County: shaded banks of Glasgow Brook, near falls, *SSSB 4289*. A single but very vigorous colony was seen in ascending Glasgow Brook to its source. This was growing in a sheltered moist location near the brook and was in young fruit at the time of collection on July 2. The scraggly bushes reached a height of about one meter.

SOLIDAGO ULIGINOSA Nutt., var. *TERRAE-NOVAE* (T. & G.) Fern. Victoria County: abundant in bog, Ingonish Barrens at an elevation of 1400 feet, *SSSB 4632*; common in bog above Gray Glen Brook, *SSSB 4426*.

ACHILLEA BOREALIS Bong. (*A. Millefolium* L., ssp. *atrotegula* Boivin, var. *atrotegula*). The genus *Achillea* in Nova Scotia is extremely variable. The following specimens, however, are referable to *A. borealis*. The usual weedy character of this genus was not evident in these collections. The plants were confined to specialized habitats and seemed to offer no severe competition to associated species, in one case *Draba norvegica*. Inverness County: small colony on dry exposed cliff shelf, Big Southwest Brook, *SSSB 4563*. Victoria County: rare colonies on exposed cliff of lookoff near bog above Gray Glen Brook, *SSSB 4429*; abundant colonies on exposed headland, White Point, *SSSB 4395* and *SSSB 4397*.

ARNICA CHIONOPAPPA Fern. Inverness County: growing on a nearly perpendicular cliff, locally abundant though not conspicuous, south branch of Grand Anse River near first waterfall, *SSSB 4681*.

II. RECORDS OF PLANTS RARE IN THE PROVINCE

WOODSIA GLABELLA R. Br. Reported once previously by Robinson (1904) from near Cheticamp, Inverness County, the following are the only recent collections of this fern. Inverness County: occasional in shaded

crevices of limestone cliffs, Big Southwest Brook, *SSSB 4574*; occasional on cliff, Grand Anse River, south branch, *SSSB 4682*.

BOTRYCHIUM DISSECTUM Spreng. Previously known from the western part of the province, the following two records represent its known occurrence in Eastern Nova Scotia, the latter being the first report from Cape Breton Island. Pictou County: mixed forest, Lorne, *SCBS 2929*. Inverness County: rare in shaded intervale, spruce-fir woods, Cheticamp River, *SSSB 4754A*. The forma *obliquum* (Muhl.) Fern. was found in both locations.

BOTRYCHIUM SIMPLEX E. Hitchc. This species, although reported at various times from the province, is very rare. It strongly resembles *B. matricariaefolium* A. Br., and its specific identity from this is not marked. The following collections, both of weak individuals, were made in wet habitats. Inverness County: very rare in wet moss, margin of waterfall, tributary of North Aspy River, *SSSB 4584*. Victoria County: small colony in wet mossy shaded bank of Clyburne Brook, *SSSB 4380*.

SCHIZAEA PUSILLA Pursh. Well known from its local stations in the province, this species was noted to be frequent in the bogs of the interior of the northern Cape Breton plateau. The following two stations record this species from the southeastern part of the province. Halifax County: boggy edge of road to Spruce Hill Lake, *E. Gorham, D. Livingston, J. Lewis, L. Decker, 137*. Cape Breton County: very rare in bog, Belfrey Barren, *SSSB 5113*. The species seems not to persist under severe competition and is therefore found most commonly on recently denuded, damp, usually boggy, areas or associated with mosses, notably *Sphagnum*.

SPARGANIUM MINIMUM (Hartm.) Fries. The following collections satisfactorily reinstate this rare species in the flora of the province. It had previously been known from one collection made by G. E. Nichols in Cape Breton. Inverness County: floating in marginal water of alkaline pool, N. E. Mabou, *SSSB 4861*. Cape Breton County: abundant in water at edge of pond, Bateson, *SSSB 5216*. Victoria County: bog pools, New Haven, *SCBSB 3483*.

SPARGANIUM HYPERBOREUM Laestad. Previously known only from Louisbourg where it was collected by Macoun, it was recollected there in 1951. Cape Breton County: abundant in bog ditch, occasionally fruiting, Fort Louisbourg, *SSSB 5391*; abundant in bog pool, N. W. Cove, Scatari Island, *SSSB 5241*. Inverness County: fairly abundant in bog pools, French Mountain, *SSSB 4719*.

POTAMOGETON FILIFORMIS Pers., var. *BOREALIS* (Raf.) St. John. Discovered by Fernald at Baddeck Bay and not seen elsewhere in the province until the following collections were made. Inverness County: abundant in shallow water of Lake Ainslie, Kenloch, *SSSB 4919*; in water of pond, Cape St. Lawrence, *SCBSB 3526*; in pond Hillsborough, *SCBSB 3922*.

POTAMOGETON SPIRILLUS Tuckerm. Known from the southwestern counties, the following collections show the distribution in the northern part of the province. Cumberland County: underwater, Halfway River, *J. S. Erskine 51.239*. Colchester County: submerged in sluggish stream,

Brookfield, *W. G. Dore and A. E. Roland 994* (DAO). Pictou County: sandy shores of Black Brook Lake, *Eville Gorham*, August 3, 1946 (DAO). Antigonish County: shallow water, Cooper Lake, *Eville Gorham*, July 25, 1946 (DAO). Guysborough County: in river four miles north of Sherbrooke, *J. S. Erskine 51.576*. Richmond County: occasional in marginal shallows of Grand Lake, Isle Madame, *SSSB 5074*; in shallows, Ferguson Lake, *SSSB 5162*. Inverness County: abundant in small brook draining pond, Monk's Head, *SSSB 4761*.

NAJAS FLEXILIS (Willd.) Rostk. & Schmidt. This species has been rarely collected in the province. The collections of the past summer, however, show it to be relatively common. Richmond County: in water of Grand Lake, Isle Madame, *SSSB 5067*. Cape Breton County: abundant in muddy shallows of pond behind beach, Catalogne Beach, *SSSB 5164*. Inverness County: marginal shallows of Lake Ainslie, Kenloch, *SSSB 4910*. Other collections of interest are from Kings County: Tannery Pond, Wolfville, *D. S. Erskine, 751*. Colchester County: in river above Shubenacadie, *J. S. Erskine 51.747*.

GLYCERIA FLUITANS (L.) R. Br. Reported only from swales, ditches, and wet meadows near Truro, Colchester County (Dore and Roland, 1942), the following collection represents the second from the province, and the first from Cape Breton Island. Inverness County: dry sand of lake shore, Kenloch, *SSSB 4942*.

POA ALSODES Gray. Previous to these collections, only one collection was known to exist, although it was reported from Dartmouth in Lindsay's Catalogue (1877). Colchester County: river bank and thickets, St. Andrew River, *SESB 4094*; thickets along Salmon River, Kemptown, *SESB 4077*. Inverness County: banks above MacIntosh Brook, in shaded locations, *SSSB 4228*.

CYNOSURUS CRISTATUS L. Already known from two locations in the province, this introduced grass was discovered abundant in field, Glendyer, Inverness County, *SSSB 4799, SECS 1203*.

TRisetum SPICATUM (L.) Richter. The exact range of this species, which occurs in Nova Scotia only as the following varieties, has not been satisfactorily known (Dore and Roland, 1942). The following material in the Acadia University Herbarium is therefore of interest. *T. spicatum* var. *molle* (Michx.) Beal—Victoria County: on gypsum near Cape North Village, *SCBSB 3749*. Inverness County: abundant on banks of Cheticamp River, six miles from mouth, *SSSB 4756*. Dore had collected it previously from this general area. *T. spicatum* var. *pilosiglume* Fern.—Inverness County: rare on rocky banks of Cheticamp River, six miles from mouth, *SSSB 4755*, near where Dore had collected it; occasional in rock crevices, Big Southwest Brook, *SSSB 4544*. Victoria County: rare in moist rock crevices, Slaty Point, Clyburne Brook, *SSSB 4374*; occasional in rock crevices, Salmon River, *SSSB 4478, SCBS 2647*.

ELEOCHARIS PAUCIFLORA (Lightf.) Link. var. *FERNALDII* Svenson. Reported from Baddeck Bay (Fernald, 1921) where it grew on the springy border of a salt marsh, a collection made by Macoun at Grand Narrows,

Cape Breton County, July 27, 1898, antedates the above by twenty-two years. Cape Breton County: locally abundant in very wet sludge-bottomed hollows of quaking bog, one mile north of McAdam Lake, *SSSB* 5480. Inverness County: occasional in quaking mat of calcareous bog, Black River, *SSSB* 4969A.

ELEOCHARIS NITIDA Fern. This small spike rush, known previously from Belle Isle, Annapolis County (Fernald, 1922), is represented in the Acadia University Herbarium by two sheets from Kings County: Wolfville, *H. G. Perry*, June 15, 1912. Material from Scot's Bay, though immature, seems to fall within the limits of this species, *A. E. Roland* 2575.

CAREX SPICATA Huds. Occasional on margin of pool, Louisbourg Park, Cape Breton County, *SSSB* 5392. This is the first record for Cape Breton Island.

CAREX DEFLEXA Hornem. Although not considered rare, the distribution of this species in the province is not well known. The following records may be added to those reported by Roland (1947). Kings County: dryish sandy woods, Church Street, *D. S. Erskine* 920. Queens County: coniferous woods, Lowe's Landing, *SECS* 271. Victoria County: abundant in rock crevices, tributary of the North Aspy River, *SSSB* 4520; sandy alluvium in woods at edge of Roper Brook, *SSSB* 4362. Halifax County: on path, Musquodoboit Harbour, *W. G. Dore* 1437 (DAO).

CAREX TONSA (Fern.) Bickn. Queens County: field near camp, Lowe's Landing, *SECS* 204. Lunenburg County: dry sandy roadside, East River, *SECS* 345. Victoria County: locally abundant on gravelly road embankment, near mouth of Warren Brook, *SSSB* 4595. The latter record represents the first collection for Cape Breton Island; the others, first collections from the south shore of the mainland.

CAREX CONOIDEA Schkuhr. Roland (1947) reports that this sedge had not yet been collected from Cape Breton. The following collections indicate its presence there. Inverness County: abundant in meadow, Strathlorne, *SSSB* 4211. Victoria County: wet meadow, Iona, *W. G. Dore* 1471 (DAO).

CAREX ATRATIFORMIS Britt. First reported by *D. S. Erskine* (1951), this species has now been found to be fairly common in Northern Cape Breton in rock crevices of brook and river banks. Inverness County: abundant on wet dripping cliff near upper waterfall, Big Southwest Brook, southwest branch, *SSSB* 4538; locally abundant in clumps in rock crevices, Cheticamp River, *SSSB* 4722. Victoria County: very rare in wet rock crevices, Slaty Point, Clyburne Brook, *SSSB* 4378.

CAREX CASTANEA Wahl. To the two previous records may be added the following collection. Inverness County: swamp at pond edge, Cape St. Lawrence, *SCBSB* 3520.

CAREX CAPILLARIS L., var. *MAJOR* Blytt. Although reported once previously from Northern Cape Breton (*Erskine*, 1951), the past summer's collecting showed this sedge to be characteristic of calcareous rocks, in cool shaded locations on the upper reaches of the northern brooks. Vic-

toria County: abundant on damp mud and wet ledge of calcareous cliff, Gray Glen Brook, north branch, *SSSB 4443*. Inverness County: abundant in rock crevices of limestone cliff, Big Southwest Brook, *SSSB 4558*.

CALLA PALUSTRIS L. Previously thought to be rare or absent in Cape Breton, the following collections indicate its wide distribution there. Cape Breton County: Caribou Marsh near Mira, *G. C. Warren*, July 25, 1948. Victoria County: muddy brook at Baddeck, *John Macoun*, 1898; boggy pond, Big Baddeck, *SECS 1057*. Inverness County: bog, west Lake Ainslie, *SECS 1186*.

JUNCUS STYGIUS L., var. *AMERICANUS* Bucheneau. To the two known collections of this rare species may be added the following. Inverness County: very abundant at edge of bog pools, French Mountain, *SSSB 4717*. Cape Breton County: shallow trickles through bog near Fort Louisbourg, *SSSB 5390*. Richmond County: occasional in damp hummocks and hollows of bog, Gracieville, *SSSB 5138*.

SMILACINA STELLATA (L.) Desf., var. *CRASSA* Victorin. This interesting plant, reported twice from the province (Fernald, 1948), was discovered in Victoria County: rich colony in dry margin of field near coast, Bay St. Lawrence, *SSSB 4480*; grassy slope, east face of Cape North, *SCBSB 3697*. Cape Breton County: rare on exposed headland with the typical variety, near N. E. Cove, Scatari Island, *SSSB 5273*.

COMANDRA RICHARDSONIANA Fern. Previously collected by Macoun in 1883 from damp sandy soil, Sydney Mines, Cape Breton County, the following collection reinstates the species in our known flora. Victoria County: abundant among grasses and *Empetrum nigrum* L. on exposed headland, Black Point, *SSSB 4339*.

RANUNCULUS SCELERATUS L. Reported from the mainland by D. S. Erskine (1951), the following collection represents its discovery in Cape Breton Island. Cape Breton County: abundant in water of swamp hole, Main-a-Dieu, *SSSB 5201*.

DRABA NORVEGICA Gunner. This is another species previously collected only by John Macoun (no. 18987), crevices of rock, Big Intervale, Inverness County. A second station for Inverness County: locally abundant on dry exposed shelves of limestone cliffs, Big Southwest Brook, *SSSB 4562*.

SARRACENIA PURPUREA L., forma *HETEROPHYLLA* (Eaton) Fern. (var. *terrae-novae* Pylaie, forma *heterophylla* (Eaton) Boivin). This form had previously been reported from Belle Isle, Annapolis County. It has been found to be a frequent form in Northern Cape Breton, occasionally outnumbering the typical form in some of the bogs of the plateau. Inverness County: bog, four miles south of Cabot Trail, North Mountain, *SCBS 2667*; bog, French Mountain, *SCBS 2864*. Victoria County: bog, between Lake of Islands and Sunday Lake, *SCBSB 3598*; common in bog northwest of Cheticamp Lake, *SCBSB 3342*. The following two collections represent single plants found among the typical form. Queens County: swamp, Shelburne River near Lake Rossignol, *SECS 158*; bog, Long Lake,

SCBSB 3293. Occasional intermediate forms were seen in populous colonies of the species.

TILLAEA AQUATICA L. First reported from Cape Breton Island by D. S. Erskine (1951), the following collections were taken from extensive colonies. Richmond County: abundant on flat area near brackish pond, Point Michaud, *SSSB 5135*. Cape Breton County: sandy edge of pond, N. W. Cove, Scatari Island, *SSSB 5355*.

SAXIFRAGA AIZOON Jacq., var. *NEOGAEA* Butters. Two additional stations of this rare species were found in Northern Cape Breton. Victoria County: very rare on shelf of cliff, Gray Glen Brook, *SSSB 4444*. Inverness County: abundant on dry, sheltered shelves of limestone cliff, Big Southwest Brook, *SSSB 4565*.

ELATINE MINIMA (Nutt.) Fisch. & Meyer. Hitherto unknown in the province east of Halifax County, the following collections are of interest. Cape Breton County: occasional in marginal water of Gabarus Lake, *SSSB 5107*; abundant in mucky shallows of pool, Catalogne, *SSSB 5166*. Inverness County: wet sand of pond edge behind beach, West Mabou, *SSSB 5000*. Richmond County: shallow water of second lake west of Loch Lomond, *J. S. Erskine 51.1280*.

ANGELICA ATROPURPUREA L. Formerly thought to be rare and restricted to coastal areas, this species has been found to be abundant along the upper reaches of the brooks of Northern Cape Breton. Inverness County: bog-meadow, headwaters of the South Blair River, *SCBSB 3802*; gravel beach, mouth of Red River, *SECS 3802*; headwaters of MacKenzie and Red Rivers, very abundant but not collected. Victoria County: seen but not collected, brookside at headwaters of Gray Glen Brook.

CORNUS SUECICA L. Known from two stations, this plant was discovered during the past summer in Cape Breton County: abundant colonies on dry exposed headland, south-east of N. W. Cove, Scatari Island, *SSSB 5354*; very abundant on dry exposed sea-cliff, two miles north of N. W. Cove, Scatari Island, *SSSB 5279*. Although growing in abundance and in association with *C. canadensis* L., \times *C. unalaschkensis* Ledeb. was not found.

VACCINIUM CESPITOSUM Michx. Reported by D. S. Erskine (1951) as new to the province, the following collection represents its discovery on Cape Breton Island. Inverness County: locally abundant in rock crevices, Cheticamp River, *SSSB 4720*.

CONOPHOLIS AMERICANA (L.) Wallr. Known only from Fernald and Long's collection (Fernald, 1922) from the LaHave River, Bridgewater, Lunenburg County, the following collections should also be noted. Kings County: oak woods, Belcher Street near Kentville, *R. M. Lewis 1966*. Queens County: in clumps under oaks, back of fish pond, Lake Kedge-makooge, *S. Bleakney June 29, 1950*.

LITTORELLA AMERICANA Fern. It was with considerable surprise that this species was collected from several locations on Cape Breton Island. Previously it was known from Shubenacadie Grand Lake, Halifax County, where Mrs. Britton collected it in 1879 (A. Gray, 1880). Richmond

County: abundant in shallow marginal water of Ferguson Lake, *SSSB* 5116; abundant in water of lake margin, Loch Lomond, *SSSB* 5056; very abundant on wet gravelly beach of Grand River, *SSSB* 5458.

SOLIDAGO MULTIRADIATA Ait. Previously the southernmost known station for this species was on St. Paul Island (Perry, 1931). Inverness County: very rare on moist shaded limestone cliff ledges, Big Southwest Brook, *SSSB* 4571.

ERIGERON PHILADELPHICUS L. Rare in Nova Scotia, the following represents a third station for the province. Halifax County: large colony in field between Upper Musquodoboit and Dean, *SESB* 4123.

BIDENS CERNUA L., var. *MINIMA* (Huds.) Pursh. This tiny extreme, known previously from the boggy margin of Hebb's Lake, Bridgewater (Fernald, 1922); bog at margin of sea, Gabarus, C. B., (Rousseau, 1938), was found in a large colony on the sandy shore of Lake Ainslie at Kenloch, Inverness County, *SSSB* 4912.

Material substantiating the majority of these records has been deposited at Acadia University Herbarium.—PERRY BIOLOGICAL LABORATORIES, ACADIA UNIVERSITY, WOLFVILLE, NOVA SCOTIA.

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